PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Bangalore Trunk Road, Varadharajapuram,
Poonamallee, Chennai – 600 123.

Department of Electrical and Electronics Engineering
B.E- Electrical and Electronics Engineering

CURRICULUM AND SYLLABUS

REGULATION-2021

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. To prepare students to analyze, design and implement basic electrical circuits and power systems using the knowledge of basic science and mathematics.
2. To train students with scientific and engineering knowledge so as to comprehend, analyze, design and create novel products and solutions for real time problems.
3. To prepare students with robust knowledge in core engineering for the betterment of placement, research and higher studies.
4. To inculcate graduates with communication skills, leadership qualities in their profession and adopt to current trends by engaging in lifelong learning.
5. To prepare graduates to demonstrate professionalism with social and ethical values

PROGRAM OUTCOMES (PO)

1. **Engineering knowledge:**

   Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

2. **Problem Analysis:**

   Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:**

   Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:**

   Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information.

5. **Modern tool usage:**

   Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**

   Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and Sustainability**

   Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

8. **Ethics**

   Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and Team Work**

   Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**

    Communicate effectively on complex engineering activities with the engineering community and with society at large. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project Management and Finance**

    Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Lifelong learning**

    Recognise the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO 1. Apply the basic knowledge of mathematics, science, electrical and electronics engineering to analyze and solve the complex problems in Electrical Machines, Control Systems, Instrumentation, Power Systems and Power Electronic Systems.

PSO 2. Design and develop hardware and software requirements to meet the needs of Electric drives, Automation, Power Systems and Embedded systems based industries.

PSO 3. To take up roles in a team, develop managerial skills, and contributes towards the electrical community globally.

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B.E- Electrical and Electronics Engineering
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABUS - R 2021

OPEN ELECTIVE – I

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CE1008	Recent Trends in Water Treatment	OE	3	3	0	0	3
2.	21CS1004	Web Design and Management	OE	3	3	0	0	3
3.	21CS1005	Mobile Application Development	OE	3	3	0	0	3
4.	21CS1006	Fundamentals of Data Base Management Systems	OE	3	3	0	0	3
5.	21ME1009	Industrial Safety and Maintenance	OE	3	3	0	0	3
6.	21EC1007	IoT Concepts and Applications	OE	3	3	0	0	3
7.	21CS1007	Ethical Hacking	OE	3	3	0	0	3
8.	21ME1011	Power Plant Engineering	OE	3	3	0	0	3
9.	21EE1003	Energy storage systems	OE	3	3	0	0	3
10.	21EC1010	Drone Technologies	OE	3	3	0	0	3
11.	21GE1004	Principles of Management	OE	3	3	0	0	3

OPEN ELECTIVE – II

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21CS1008	Introduction to C programming	OE	3	3	0	0	3

2.	21AD1001	Fundamentals of Artificial intelligence	OE	3	3	0	0	3
3.	21CS1003	Data Structures and Algorithms	OE	3	3	0	0	3
4.	21EC1001	VLSI Design	OE	3	3	0	0	3
5.	21EE1005	Energy Conservation and Management	OE	3	3	0	0	3
6.	21EE1002	Hybrid Energy Technology	OE	3	3	0	0	3
7.	21CS1009	Business Intelligence	OE	3	3	0	0	3
8.	21GE1002	Human Resource Management	OE	3	3	0	0	3
9.	21ME1012	Industrial Engineering	OE	3	3	0	0	3
10.	21CS1001	Cloud Computing	OE	3	3	0	0	3
11.	21CE1010	Air Pollution and Control Engineering	OE	3	3	0	0	3

OPEN ELECTIVE -I

21CE1008	RECENT TRENDS IN WATER TREATMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide students an exposure to recent trends treatment process of water.
- Ability to apply the knowledge of treatment methods in current environmental issues. Ability to effectively and efficiently manage the water pollution problems.
- To deal with technical aspects of drinking water treatment and distribution in an integrated way, paying attention to the choice of technologies and tools, ranging from low-cost to advanced options.

UNIT - I INTRODUCTION TO WATER TREATMENT 9

Water demand – Sources of water and their characteristics, Surface and Groundwater – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

UNIT - II INTERNAL TREATMENT PROCESS 9

Characteristics and properties – Water problem and solution – Water Sedimentation - Coagulation – Filtration – Disinfection – Theory, necessity, process, equipment, application, location, limitation.

UNIT - III EXTERNAL TREATMENT PROCESS 9

Softening by Ion – exchange process, Demineralization – Cation exchange materials – Removal of ion, Manganese, odour, colour taste – De-aeration – Oxidation – Fluoridation– Dealkalisation – Desalination by Reverse osmosis.

UNIT - IV BOILER WATER AND COOLING WATER 9

Concept – Importance – Location – Commonly used desalination process – Distillation – Electrodialysis – Reverse osmosis – Freezing – Solar distillation- Purpose – Problem associated with water quality and equipment – Steam system fundamentals – Hot water closed system – Measurement and control of pH, corrosion, fouling – Microbial analysis – Ozone control – Study of microorganism – Energy efficient operations and maintenance.

UNIT - V ADVANCED WATER TREATMENT METHODS 9

Construction and Operation & Maintenance aspects – Recent advances - MBR process –Low-Pressure Membranes- High-Pressure Membranes -Two-Stage Membrane Filtration- Nanotechnology.-Acoustic nano tube technology- Photo-catalytic water purification technology- Aquaporin Inside technology- Automatic Variable Filtration (AVF) technology-Ultraviolet Irradiation Technology- Advanced Oxidation Technology.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. To summarized the water quality standards in the water treatment.
2. To infer the concept of internal treatment process in water treatment.
3. To understand the knowledge of Demineralization, Dealkalisation – and Desalination
4. To analyze the Steam system fundamentals and Energy efficient operations and maintenance
5. To understand the advanced water treatment process.

TEXT BOOKS:

1. Garg, S.K. Environmental Engineering, Vol. I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol. I Standard Book House, New Delhi, 2010.
3. Punmia, B.C., Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi, 2014.
4. P.C.Bansil "Water Management in India", Concept Publishing company, New Delhi, First Edition, 2004.
5. G.S.Bridie and J.S.Bridie "Water Supply and Sanitary Engineering", Dhanpat Raj Publishing company (P) Ltd., New Delhi, 7th Edition, 2003

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Motley Guang Zhu, Water Works Engineering Planning, Design and Operation, Prentice Hall of India Learning Private Limited, New Delhi, 2009.
3. Austin G.T., "Shreve's Chemical Process Industries", Fifth Edition, McGraw Hill, 1998
4. S.C. Rangwala, "Water supply and Sanitary Engineering", Eighteenth Edition, Charotar Publishing House, 2003.
5. Pandey G.N., "Text Book of Chemical Technology", Vikas Publishing House Pvt. Ltd., New Delhi, 1992

21CS1004	WEB DESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Learn the basic concepts in HTML, CSS, Javascript
- To Understand the responsive design and development
- To highlight the web frameworks in Web 2.0
- To Design a Website with HTML, JS, CSS / CMS - Word press
- To implement the project using CSS and open source.

UNIT - I WEB DESIGN – HTML MARKUP FOR STRUCTURE AND CSS 10

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links -Adding Images - Table Markup - Forms - HTML5, CSS - Formatting text - Colours a Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS Transition, Transforms and Animation – JavaScript - Using JavaScript.

SUGGESTED ACTIVITIES:

- Create HTML web page using CSS and JS
- Create colorful web page design using CSS box model.

SUGGESTED EVALUATION METHODS:

- Quiz on HTML basic tags and CSS layout
- Assignment submission on creating web page for different application
-

UNIT - II RESPONSIVE WEB DESIGN 8

Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or Desktop- First –CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger -Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design.

SUGGESTED ACTIVITIES:

- Create a simple web design using /Java /any language
- Design small UI

SUGGESTED EVALUATION METHODS:

- Build a responsive SaaS web page design
- Create a Code for responsive web design videos.

UNIT - III WEB FRAMEWORK 9

Django Template System - Interacting with a Database (Modules) - Django Administration Site, Form Processing, Advanced Views and Urlconfs, Generic Views - Extending the Template Engine - Generating Non-HTML Content, Sessions, Users, Registration, Caching, Other Contributed Sub Frameworks, Middleware, Integrating with Legacy Databases and Applications, Extending Django's Admin Interface, Internationalization, Security and Deploying Django. The Model Definition Reference, The Data Base API Reference, Generic Views Reference, Settings, Built-In Template Tags and Filters, The Django - Admin Utility and Request and Response Objects. – Web App - Ruby Language – Ruby on Rails – Framework – Action Controller and Action View - RDF, Rdfa, OWL and Jena.

SUGGESTED ACTIVITIES:

- Use web application framework software like Django, Flask to design and support theweb application.
- Build web application using Ruby language

SUGGESTED EVALUATION METHODS:

- Assignment on web framework tool

UNIT - IV WEB PROJECT MANAGEMENT 9

Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting- Running the project - Technical Documentation - Development, Communication, Documentation – QA and testing -Deployment - Support and operations.

SUGGESTED ACTIVITIES:

- Case studies on Technical documentation
- Real world domain specific problems involving project life cycle.

SUGGESTED EVALUATION METHODS:

- Student assignment on case studies related to healthcare, climate change, ecommerce, retail business, manufacturing etc.

UNIT - V PRODUCTION, MAINTENANCE AND EVALUATION 9

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation-Case Study: Using the Skills and Concepts Learn with the ADOBE IMAGE READY, DREAM WEAVER, FLASH, and Scripts, Develop Portfolios in the Form of Web Pages which have to be uploaded in Free Public Domains.

SUGGESTED ACTIVITIES:

- Case studies on applications involving concept of adobe image ready.
- Demonstration of develop portfolio in form of web page.

SUGGESTED EVALUATION METHODS:

- Quiz on Testing and develop portfolio

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of the course student will be able to:

1. Design Website using HTML CSS and JS.
2. Design Responsive Sites
3. Identify the suitable web framework to support the development of web applications.
4. Manage, Maintain and Support Web Apps
5. Write and demonstrate simple web applications involving CSS
6. Create and maintain responsive websites and employ strategies with user-centered design methodologies.

TEXT BOOKS:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011

REFERENCES:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons,edition 2014
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development", John Wiley and Sons, edition 2014

WEB REFERENCES:

1. http://rubyonrails.org/
2. http://www.djangobook.com
3. http://www.w3schools.com

ONLINE COURSES / RESOURCES:

1. http://www.udemey.com
2. http://www.coursera.org
3. http://www.simplelearn.com

21CS1005	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To learn how to utilize rapid prototyping techniques to design and develop sophisticatedAndroid application.
- To understand the platform for developing mobile application
- To show their ability to deploy software to mobile devices
- To exhibit their ability to debug programs running on mobile devices

UNIT - I INTRODUCTION TO ANDROID OPERATING SYSTEM 9

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

SUGGESTED ACTIVITIES:

- Understanding the Android OS
- Acquire knowledge on basic building blocks of Android programming required for App development.

SUGGESTED EVALUATION METHODS

- Quizzes
- Assignments

UNIT - II CONTROLS AND USER INTERFACE 9

Measurements – Device and pixel density independent measuring units - Layouts Linear, Relative, Grid and Table Layouts - User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers -Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

SUGGESTED ACTIVITIES:

- Acquire the knowledge on Android devices and Platform.
- Understanding the UI components

SUGGESTED EVALUATION METHODS:

- Pedagogical tools
- Assignments

UNIT - III INTENTS AND BROADCASTS 9

Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS -Broadcast Receivers –Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts- Accessing Databases

SUGGESTED ACTIVITIES:

- Understanding the working principle of Android for app development.
- Develop and publish Android applications in to Android Market

SUGGESTED EVALUATION METHODS

- Quizzes
- Crossword puzzles

UNIT - IV INTRODUCTION TO iOS 9

Introduction to iPhone, MVC Architecture, View Controller - Building the UI and Event handling, Application life cycle, Tab Bars, Story Boards and Navigation Controllers, Table View, Push Notification, Database handling, Introduction to icloud, Webkit framework in iOS8, Deploying and publishing application.

SUGGESTED ACTIVITIES:

- Understand the concepts of iOs.
- Develop and publish applications using iOS

SUGGESTED EVALUATION METHODS

- Assignments
- Crossword puzzles

UNIT - V WINDOWS MOBILE APP DEVELOPMENT 9

Introduction to Windows Phone 8, Application Life cycle, UI Designing and events, Building, Files and Storage, Network Communication, Push Notification, Background Agents, Maps and Locations, Data Access and storage, Introduction to Silverlight and XAML, Data Binding, Deploying and Publishing.

SUGGESTED ACTIVITIES:

- Understand the windows phone concepts.
- To learn the concepts of data binding, deploying and publishing

SUGGESTED EVALUATION METHODS

- Assignments
- Quizzes

TOTAL: 45 PERIODS

OUTCOMES:

After completion the above subject, students will be able to understand:

1. Learn and understand the technology and business trends impacting mobile application.
2. Understand and remember the components of android, iOS, and windows mobile application.
3. Learning the techniques for developing mobile applications

4. Create the mobile applications with compelling user interface and database connectivity forreal time applications.
5. Apply and develop mobile application with iOS platform
6. Develop and deploy mobile applications using Silverlight.

TEXT BOOKS:

1. Reto Meier, “Professional Android Application Development”, Wrox, 2010.
2. David Mark, Jack Nutting and Jeff LaMarche, “Beginning iOS 6 Development Exploring theiOS SDK”, Apress, 2013

REFERENCES:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2. Baijian Yang, Pei Zheng, Lionel M. Ni, “Professional Microsoft Smartphone Programming”,Wrox Edition

WEB REFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

21CS1006	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts and the applications of database systems.
- To understand the various data models
- To learn the relational database design principles.
- To know the basics of SQL and construct queries using SQL.
- To familiar with the basic issues of transaction processing and concurrency control

UNIT - I DATABASE FUNDAMENTALS 9

Introduction: Database System Applications, Purpose of Database Systems, View of Data, components and structure, Database Users and Administrator, History of Database Systems.

UNIT - II DATA MODELS 9

ER model, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Enhanced E-R Model.

UNIT - III RELATIONAL DATABASE 9

Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, Normalization (1NF, 2NF, 3NF, BCNF).

UNIT - IV STRUCTURED QUERY LANGUAGE 9

Introduction, data definition in SQL, table, key and foreign key definitions, update behaviours. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses, embedded SQL

UNIT - V TRANSACTION MANAGEMENT AND CONCURRENCY 9

Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

1. Remember the Structure of a Database
2. Understand an Entity Relational Model for a database.
3. Apply Relational database concepts to design a database.
4. Analyze the importance of normalization and functional dependencies in database design
5. Understand transaction processing and concurrency control

6. Create a database design using Relational models

TEXT BOOKS:

1. Data base System Concepts, A. Silberschatz, Henry. F. Korth, S. Sudarshan, McGrawHill India Private Limited, 7th edition.

REFERENCES:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGrawHill Education (India) Private Limited, 3rd Edition.

21ME1009	INDUSTRIAL SAFETY AND MAINTENANCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Identify unsafe conditions and recognize unsafe alerts.
- Interpret the rules and regulations for safety operations.
- Capable of solving problem of accidents
- Capable of solving the present for criticizing the present for improved safety.
- Collaborate and modify processes / procedures for safety

UNIT - I INTRODUCTION 9

Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT - II CHEMICAL HAZARDS 9

Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology

UNIT - III ENVIRONMENTAL CONTROL 9

Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT - IV HAZARD ANALYSIS 9

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT - V SAFETY REGULATIONS 9

Explosions – Disaster management – catastrophe control, hazard control , Factories Act, Safety regulations Product safety – case studies.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

1. Identify and prevent chemical, environmental mechanical, fire hazard.
2. Collect, analyze and interpret the accidents data based on various safety techniques.
3. Apply proper safety techniques on safety engineering and management
4. Able to perform hazard analysis
5. Aid to design the system with environmental consciousness by implementing safety regulation.

TEXT BOOKS:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCES:

1. David L.Goetsch, “Occupational Safety and Health for Technologists”, Engineers and Managers, Pearson Education Ltd. 5th Edition, 2005.
2. Deshmukh L M, “Industrial Safety Management”, Tata McGraw-Hill Publishing Company Ltd.,2005
3. Safety Manual, “EDEL Engineering Consultancy”, 2000.

WEB REFERENCES:

1. https://www.asme.org/codes-standards/publications-information/safety-codes-standards
2. https://www.nfpa.org/Codes-and-Standards/All-Codes-and-Standards/List-of-Codes-and-Standards
3. https://link.springer.com/chapter/10.1007/978-1-84882-472-0_22

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/110105094
2. http://www.nitttrc.edu.in/nptel/courses/video/110105094/L51.html
3. https://www.digimat.in/nptel/courses/video/110105094/L01.html

21EC1007	IOT CONCEPTS AND APPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Smart Objects and IOT Architectures
- To learn about various IOT-related protocols
- To build simple IOT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IOT
- To develop IOT infrastructure for popular applications.

UNIT - I FUNDAMENTALS OF IOT 9

Evolution of Internet of Things - Enabling Technologies - IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models - Simplified IOT Architecture and Core IOT Functional Stack - Fog, Edge and Cloud in IOT - Functional blocks of an IOT ecosystem - Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT - II IOT PROTOCOLS 9

IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11 ah and Lora WAN - Network Layer: IP versions, Constrained Nodes and Constrained Networks - Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks - Application Transport Methods: Supervisory Control and Data Acquisition - Application Layer Protocols: CoAP and MQTT.

UNIT - III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IOT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT - IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest - Role of Machine Learning - No SQL Databases - Hadoop Ecosystem - Apache Kafka, Apache Spark - Edge Streaming Analytics and Network Analytics - Xively Cloud for IOT, Python Web Application Framework - Django -AWS for IOT - System Management with NETGONF-YANG

UNIT - V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Cisco IOT system - IBM Watson IOT platform - Manufacturing - Converged Plant wide Ethernet Model (CPwE) - Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

1. Explain the concept of IOT

2. Analyze various protocols for IOT.
3. Design a Poe of an IOT system using Rasperry Pi/Arduino
4. Apply data analytics and use cloud offerings related to IOT.
5. Analyze applications IOT in real time scenario

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete. Rob Barton and Jerome Henry, "IOT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press, 2015
3. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols‖, Wiley, 2012

REFERENCES:

1. Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis , arnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things‖, Springer, 2011.
3. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance your projects, 2nd Edition, O'Reilly_Media,_2011.

WEB REFERENCES:

1. https://www.arduino.cc/
2. https://www.ibm.com/smarterplanet/us/en/?ca=v smarter planet

21CS1007	ETHICAL HACKING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explore the concepts of security testing and the knowledge required to protect againsthackers and attackers.
- To understand reconnaissance and the publicly available tools used to gather informationon potential targets.
- To discover the scanning techniques used to identify network system open ports.
- To identify network system vulnerabilities and confirm their exploitability.
- To explore techniques for identifying web application vulnerabilities and attacks.

UNIT - I INTRODUCTION TO HACKING 9

Introduction to Hacking – Important Terminologies – Penetration Test – Vulnerability Assessments versus Penetration Test – Pre-Engagement – Rules of Engagement - Penetration Testing Methodologies – OSSTMM – NIST – OWASP – Categories of Penetration Test – Typesof Penetration Tests – Vulnerability Assessment Summary -Reports.

SUGGESTEDACTIVITIES:

- In-class activity to understand the penetration testing methodologies.
- Practical – Use security tools in Kali Linux to assess the vulnerabilities.
- Prepare Vulnerability Assessment summary reports.

SUGGESTEDEVALUATIONMETHODS:

- Assignment on categories of penetration testing and vulnerability summary reports.
- Quiz on penetration testing methodologies, OSSTMM and OWASP.

UNIT - II INFORMATION GATHERING AND SCANNING 9

Information Gathering Techniques – Active Information Gathering – Passive Information Gathering – Sources of Information Gathering – Tracing the Location – Traceroute – ICMP raceroute – TCP Traceroute – Usage – UDP Traceroute – Enumerating and Finger printing the Webservers – Google Hacking – DNS Enumeration – Enumerating SNMP – SMTP Enumeration – Target Enumeration and Port Scanning Techniques – Advanced Firewall/IDS Evading Techniques.

SUGGESTED ACTIVITIES:

- Explain different ways to gather information about a system in the network.
- Demonstrate the network command tools to identify the system.
- Understand the network protocols and port scanning techniques using Kali linux.

SUGGESTED EVALUATION METHODS:

- Assignment problems on information gathering and traceroute of ICMP, DNS and SNMP.
- Quizzes on enumeration, port scanning techniques and firewall/IDS evading techniques

UNIT - III NETWORK ATTACKS 9

Vulnerability Data Resources – Exploit Databases – Network Sniffing – Types of Sniffing – Promiscuous versus Nonpromiscuous Mode – MITM Attacks – ARP Attacks – Denial of ServiceAttacks –Hijacking Session with MITM Attack – SSL Strip: Stripping HTTPS Traffic – DNS Spoofing – ARP Spoofing Attack Manipulating the DNS Records – DHCP Spoofing – Remote Exploitation – Attacking Network Remote Services – Overview of Brute Force Attacks – Traditional Brute Force – Attacking SMTP – Attacking SQL Servers – Testing for Weak Authentication.

SUGGESTED ACTIVITIES:

- Familiarizing with different types of attacks such as sniffing, spoofing etc.
- Demonstrating the MITM attack using ARP Poisoning using Kali Linux.
- Teaching with case studies: SSL Stripping, SQL Injection, Brute Force attacks.

SUGGESTEDEVALUATIONMETHODS:

- Assignment on denial of service (DoS) attack and hijacking session withMITMattack.
- Quizzes on SSL stripping, ARP spoofing and weak authentication

UNIT - IV EXPLOITATION 9

Introduction to Metasploit – Reconnaissance with Metasploit – Port Scanning with Metasploit – Compromising a Windows Host with Metasploit – Client Side Exploitation Methods – E-Mails with Malicious Attachments – Creating a Custom Executable – Creating a Backdoor with SET – PDF Hacking – Social Engineering Toolkit – Browser Exploitation – Post–Exploitation – Acquiring Situation Awareness – Hashing Algorithms – Windows Hashing Methods – Cracking the Hashes – Brute force Dictionary Attacks – Password Salts –Rainbow Tables – John the Ripper – Gathering OS Information – Harvesting Stored Credentials.

SUGGESTED ACTIVITIES:

- Case studies: Understand the Metasploit and Exploitations.
- Demonstrating email with malicious attachment and cracking the hashes.
- Practical - Implementing hashing algorithms and cracking the hashes.

SUGGESTED EVALUATION METHODS:

- Assignments on social engineering toolkit and browser exploitation.
- Quizzes on reconnaissance with Metasploit and client–side exploitation methods.

UNIT - V WIRELESS AND WEB HACKING 9

Wireless Hacking – Introducing Aircrack– Cracking the WEP – Cracking a WPA/WPA2 Wireless Network Using Aircracking – Evil Twin Attack – Causing Denial of Service on the Original AP – Web Hacking – Attacking the Authentication – Brute Force and Dictionary Attacks – Types of Authentications – Log-In Protection Mechanisms – Captcha Validation Flaw – Captcha RESET Flaw – Manipulating User-Agents to Bypass Captcha and Other Protection – Authentication Bypass Attacks – Testing for the Vulnerability – Automating It with Burp Suite – Session Attacks – SQL Injection Attacks – XSS (Cross-Site Scripting) –Types of Cross-Site Scripting – Cross-Site Request Forgery (CSRF) – SSRF Attacks - penetration testing.

SUGGESTED ACTIVITIES:

- Cracking the WEP and WPA/WPA2 passphrase using Cracking tool in KaliLinux.
- Design a web application with different authentication mechanism.
- Understand the protection mechanism to prevent against various server attacks.

SUGGESTED EVALUATION METHODS:

- Assignment on evil twin attack and denial of service attack on access point inWLAN.
- Quizzes on types of authentication and vulnerabilities in a web application

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

1. Use various security tools to assess the computing system.
2. Predict the vulnerabilities across any computing system using penetration testing.
3. Identify prediction mechanism to prevent any kind of attacks.
4. Protect the system from malicious software and worms.
5. Evaluate the wireless network flaws and able to apply security patches
6. Analyze the risk and support the organization for effective security measures.

TEXT BOOKS:

1. Rafay Baloch, “Ethical Hacking and Penetration Testing Guide”, CRC Press, 2014.

REFERENCES:

1. Kevin Beaver, “Ethical Hacking for Dummies”, Sixth Edition, Wiley, 2018.
2. Jon Erickson, “Hacking: The Art of Exploitation”, Second Edition, Rogunix,2007.

WEB REFERENCES:

1. https://www.tutorialspoint.com/ethical_hacking/index.html
2. https://www.javatpoint.com/ethical-hacking

3. https://www.tsoungui.fr/ebooks/Ethickal-haking-postexploitation.pdf

ONLINE COURSES / RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs13/preview

21ME1011	POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance

UNIT - I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle — improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants — Fuel and ash handling, Draught system, Feed water treatment and Binary Cycles. Cogeneration systems.

UNIT - II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle — Analysis & Optimization. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT - III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT - IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants — Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Ocean current power generation, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT - V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to:

1. Discuss the layout, construction and working of the components inside a thermal power plant
2. Analysis the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants
3. Understand the layout, construction and working of the components inside nuclear power plants.

4. Understand the layout, construction and working of the components inside Renewable energy power plants.
5. Analysis the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOKS:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.
4. Domundwar, AroraDomkundwar., “Power Plant Engineering”, DhanpatRai&Co.,2016.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=iWWyI8CZhUw

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/112107291

21EE1003	ENERGY STORAGE SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: The student should be made to:

- Understand the various types of energy storage Technologies.
- Analyze thermal storage system
- Analyze different battery storage technologies
- Analyze the thermodynamics of Fuel Cell
- Study the various applications of energy storage systems.

UNIT - I INTRODUCTION 9

Necessity of energy storage – types of energy storage – comparison of energy storage technologies – Applications.

UNIT - II THERMAL STORAGE SYSTEM 9

Thermal storage – Types – Modeling of thermal storage units – Simple water and rock bed storage system – pressurized water storage system – Modelling of phase change storage system – Simple units, packed bed storage units - Modelling using porous medium approach, Use of TRNSYS.

UNIT - III ELECTRICAL ENERGY STORAGE 9

Fundamental concept of batteries – measuring of battery performance, charging and discharging, power density, energy density, and safety issues. Types of batteries – Lead Acid, Nickel – Cadmium, Zinc Manganese dioxide, Li-ion batteries - Mathematical Modelling for Lead Acid Batteries – Flow Batteries.

UNIT - IV FUEL CELL 9

Fuel Cell – History of Fuel cell, Principles of Electrochemical storage – Types – Hydrogen oxygen cells, Hydrogen air cell, Hydrocarbon air cell, alkaline fuel cell, detailed analysis – advantages and disadvantages.

UNIT - V ALTERNATE ENERGY STORAGE TECHNOLOGIES 9

Flywheel, Super capacitors, Principles & Methods – Applications, Compressed air Energy storage, Concept of Hybrid Storage – Applications, Pumped Hydro Storage – Applications.

Total:45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Understand different types storage technologies
2. Design a thermal storage system
3. Model battery storage system
4. Analyze the thermodynamics of fuel cell
5. Analyze the appropriate storage technologies for different applications
6. Explore the alternate energy storage technologies.

TEXT BOOKS:

1. Ibahim Dincer and Mark A. Rosen, 'Thermal Energy Storage Systems and Applications', John Wiley & Sons, 3rd Edition, 2021.
2. Ru-shi Liu, Lei Zhang and Xueliang sun, 'Electrochemical technologies for energy storage and conversion', Wiley publications, 2nd Volume set, 2012.
3. James Larminie and Andrew Dicks, 'Fuel cell systems Explained', Wiley publications, 3rd Edition, 2018

REFERENCES:

1. Lunardini.V.J, 'Heat Transfer in Cold Climates', John Wiley and Sons 1981, 1st Edition.
2. Schmidt.F.W. and Willmott.A.J., 'Thermal Energy Storage and Regeneration', Hemisphere Publishing Corporation, 1981, 1st Edition.

ONLINE COURSES / RESOURCES:

1. https://nptel.ac.in/courses/113105102
2. https://nptel.ac.in/courses/112105221.

21EC1010	DRONE TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES: The course should enable the students to:

- To make the students to understand the basic concepts of UAV drone systems.
- To introduce the stability and control of an aircraft

UNIT - I INTRODUCTION TO DRONES 9

Introduction to Unmanned Aircraft Systems, History of UAV drones, classification of drones, System Composition, applications.

UNIT - II DESIGN OF UAV DRONE SYSTEMS 9

Introduction to Design and Selection of the System, Aerodynamics and Airframe Configurations, Characteristics of Aircraft Types, Design Standards and Regulatory Aspects-India Specific, Design for Stealth.

UNIT - III AVIONICS HARDWARE OF DRONES 9

Autopilot, AGL-pressure sensors servos-accelerometer–gyros-actuators- power supply-processor, integration, installation, configuration.

UNIT - IV COMMUNICATION, PAYLOADS AND CONTROLS 9

Payloads, Telemetry, Tracking, controls-PID feedback, radio control frequency range, modems, memory system, simulation, ground test-analysis-trouble shooting.

UNIT - V NAVIGATION AND TESTING 9

Waypoints navigation, ground control software, System Ground Testing, System In-flight Testing, Future Prospects and Challenges

Total:45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Ability to design UAV drone system
2. To understand working of different types of engines and its area of applications.
3. To understand static and dynamic stability dynamic instability and control concepts
4. To know the loads taken by aircraft and type of construction and also construction materials in them.

TEXT BOOKS:

1. Reg Austin “Unmanned Aircraft Systems UAV design, development and deployment”, Wiley, 2010.
2. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.

REFERENCES:

1. Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, Springer, 2007
2. Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998
3. Dr. Armand J. Chaput, “Design of Unmanned Air Vehicle Systems”, Lockheed Martin Aeronautics.

21GE1004	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: The student should be made to:

- To enable the students to know about the evolution, functions and principles of Management.
- To make the students understand about planning, setting up of objectives & Decision Making.
- To enable students, understand about organisation structure, delegation of authority, HRM, Training & Development.
- To enable students know about effective communication in the organization
- To study the system and process of effective controlling and application of the principles in the organization

UNIT - I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization Environment – Current trends and issues in Management.

UNIT - II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Planning Tools and Techniques – Decision making steps and process.

UNIT - III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT - IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT - V CONTROLLING 9

Controlling and its types & Process – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling.
2. Have some basic knowledge on Communication & Motivation.
3. Have the ability to apply the principles of management in the organization.

TEXT BOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004.
2. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009

REFERENCES:

1. Harold Koontz & Heinz Weihrich, “Essentials of Management”, Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata Mcgraw Hill, 2010

OPEN ELECTIVE-II

21CS1008	INTRODUCTION TO C PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquire knowledge to write an algorithm and flowchart for problems
- To study and develop C programs using operators, expressions and control flow
- To learn the concept for functions and pointers
- To gather knowledge about structure and I/O
- To learn about processing of files

UNIT - I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms, Art of Programming through Algorithms and Flowcharts-History and importance of C - Applications of C Language - Structure of C program – Basics: Data Types – Constants –Variables - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers.

SUGGESTED ACTIVITIES:

- Understanding the constructs of C Language.
- Control the sequence of the program and give logical outputs
- Understanding the uses of pre-processors and various memory models

SUGGESTED EVALUATION METHODS:

- Tutorial on conditionals and loops.
- Assignments

UNIT - II ARRAYS 9

Introduction to Arrays – One dimensional array: Declaration – Initialization - Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Read – Print – Sum – Transpose – Multiplication- Exercise Programs: Print the number of positive and negative values present in the array – Sort the numbers using bubble sort - Find whether the given is matrix is diagonal or not.

SUGGESTED ACTIVITIES:

- Understanding the purpose of array
- Design and implement applications using arrays
- Develop an application to perform matrix operations using multi-dimensional arrays

SUGGESTED EVALUATION METHODS:

- Pedagogical tools
- Assignments

UNIT - III STRINGS & POINTERS 9

Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement – Array of strings – Pointers: Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names.

SUGGESTED ACTIVITIES:

- Understanding the purpose of strings
- Developing C programs using strings

SUGGESTED EVALUATION METHODS:

- Quizzes
- Tabulate the different strings functions and its purpose

UNIT - IV FUNCTIONS 9

Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by 'n' devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function)

SUGGESTED ACTIVITIES:

- Apply code reusability with functions and pointers
- Develop and implement modular applications in C using functions.

SUGGESTED EVALUATION METHODS:

- Assignments
- Pedagogical Techniques

UNIT - V STRUCTURES, UNIONS AND FILE MANAGEMENT 9

Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – typedef – Union - Storage classes and Visibility. Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions) - Defining and opening a file, closing a file, Input/output and Error Handling on Files.

SUGGESTED ACTIVITIES:

- Demonstration of real-world applications using file operations.
- Implementing applications using Unions, Enumerations and typedef.
- Understanding the basics of file handling mechanisms

SUGGESTED EVALUATION METHODS:

- Quizzes
- Assignment

TOTAL: 45 PERIODS

OUTCOMES:

After completion the above subject, students will be able to understand:

1. Ability to implement the algorithms and flow chart for solving mathematical andengineering problems
2. Develop C programs for real world/technical application using basic constructs
3. Implement C programs using control structures
4. Explore the usage of arrays, pointers and functions in C.
5. Implement Programs with structures and union in C.
6. Design applications using sequential and random access file processing

TEXT BOOKS:

1. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

REFERENCES:

1. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”,McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition,Pearson Education, 2013.

WEB REFERENCES:

1. https://github.com/tscheffl/ThinkC/blob/master/PDF/Think-C.pdf
2. https://freecomputerbooks.com/langCBooks.html

ONLINE COURSES / RESOURCES:

1. https://www.programiz.com/c-programming 2
2. https://www.tutorialspoint.com/cprogramming/index.htm
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.geeksforgeeks.org/c-programming-language/
5. https://en.wikibooks.org/wiki/C_Programming

21AD1001	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES: The student should be made to:

- Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents
- Understand search techniques and gaming theory
- The student will learn to apply knowledge representation techniques and problem solving strategies to common AI applications.
- Student should be aware of techniques used for classification and clustering.
- Student should aware of basics of pattern recognition and steps required for it.

UNIT - I INTRODUCTION 9

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT - II PROBLEM SOLVING METHODS 9

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

UNIT - III KNOWLEDGE REPRESENTATION 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

UNIT - IV SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT - V APPLICATIONS 9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. To learn the fundamentals of natural language processing
2. To understand the use of CFG and PCFG in NLP.
3. To understand the role of semantics of sentences and pragmatic.
4. To Introduce Speech Production And Related Parameters Of Speech.

5. To Show The Computation And Use Of Techniques Such As Short Time Fourier Transform, Linear Predictive Coefficients And Other Coefficients In The Analysis Of Speech.

TEXT BOOKS:

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, “Prolog: Programming for Artificial Intelligence”, Fourth edition, AddisonWesley Educational Publishers Inc., 2011.
3. M. Tim Jones, —Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.First Edition, 2008

REFERENCES:

1. Nils J. Nilsson, —The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
2. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
3. Gerhard Weiss, —Multi Agent Systems‖, Second Edition, MIT Press, 2013.
4. David L. Poole and Alan K. Mackworth, —Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

21CS1003	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADTs
- To design linear data structures–lists, stacks, and queues
- To understand sorting algorithms
- To understand the concept of searching and hashing algorithms
- To apply Tree and Graph structures

UNIT - I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation —singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

SUGGESTED ACTIVITES:

- Developing and application (student's choice using all the linear data structures

SUGGESTED EVALUATION METHODS:

- Programs and Demonstration on applications of linear data structures.
- Checking output of programs implemented.
- Assignments.

UNIT - II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue-Priority Queue – deQueue – applications of queues- Job Scheduling- Josephus problem.

SUGGESTED ACTIVITES:

- Demonstrating stack for Towers of Hanoi application.

SUGGESTED EVALUATION METHODS:

- Programs on applications of Stacks and Queues
- Quiz on various topics of the unit
- Assignments

UNIT - III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – Representation of Trees- Binary Tree –Tree traversal– expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree B+ Tree –Trie - Heap – Applications of heap

SUGGESTED ACTIVITES:

- Solving expressions using expression trees by determining infix, prefixand postfix expressions.
- Developing any application using trees.

SUGGESTED EVALUATION METHODS:

- Programs using tree traversal and binary tree
- Programs on binary search trees.
- Programs and Demonstration using AVL tree applications.
- Assignments

UNIT - IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth- first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs- Shortest path algorithms- Minimum spanning trees- Prims and Kruskal Algorithms Applications of BFS: Graph Coloring.

SUGGESTED ACTIVITES:

- External learning- Applications of graphs.
- Practical- To choose and apply a suitable graph algorithm for solving a real time problem /scenario such as Network Routing.

SUGGESTED EVALUATION METHODS:

- Assignments on representation of graphs for a given problem
- Quizzes on basics of graphs.
- Programs and Demonstration using application of graph and topological sort

UNIT - V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting –Quick Sort - Bubble sort - Selection sort - Heap Sort –Merge Sort - Insertion sort – Bucket sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing

SUGGESTED ACTIVITES:

- External learning- Applications of graphs.
- Practical-To choose and apply a suitable graph algorithm for solving a real time problem/scenario such as Network Routing.

SUGGESTED EVALUATION METHODS:

- Tutorials on external sorting.
- Tutorials on hashing.
- Check output of programs implemented

TOTAL= 45 PERIODS

OUTCOMES:

Students will be able to:

1. Implement abstract datatypes for linear data structures.
2. Apply the different linear data structures to problem solutions.
3. Model problems as Tree problems and implement efficient Tree algorithms to solve them.
4. Model problems as graph problems and implement efficient graph algorithms to solve them.
5. Critically analyze the various sorting algorithms.

6. Analyze the various searching and hashing algorithms

TEXT BOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition,Pearson education, 2011.
2. Reema Thareja, 'Data Structures Using C', Second Edition , Oxford University Press,2011

REFERENCES:

1. Thomas H.Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introductionto Algorithms", Second Edition, McGraw Hill,2002
2. Aho,HopcroftandUllman,"DataStructuresandAlgorithms", PearsonEducation, 1983
3. StephenG.Kochan, "ProgramminginC", 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structuresin C", Second Edition,University Press,2008

21EC1001	VLSI DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explain the basic concepts of CMOS.
- To introduce the IC fabrication methods.
- To introduce the Reconfigurable Processor technologies.
- To introduce the basics of analog VLSI design and its importance.
- To learn about the programming of Programmable device using Hardware description Language.

UNIT - I CMOS BASICS 9

MOSFET Scaling - CMOS logic design- Dynamic CMOS –Transmission Gates- BiCMOS.

UNIT - II IC FABRICATION 9

CMOS IC Fabrications: n well, p well, twin tub, SoI - Design Rules and Layout.

UNIT - III PROGRAMABLE LOGIC DEVICES 9

PAL, PLA, CPLD architecture and application.

UNIT - IV RECONFIGURABLE PROCESSOR 9

FPGA- Architecture, FPGA based application development- Introduction to FPAA

UNIT - V HDL PROGRAMMING 9

Verilog HDL- Overview - structural and behavioural modeling concepts-Design examples- Carry Look ahead adders, ALU, Shift Registers.

TOTAL = 45 PERIODS

OUTCOMES:

At the end of this course, the students will have the ability to:

1. Develop CMOS design techniques.
2. Learn and build IC fabrication.
3. Explain the need of reconfigurable computing with PLDs.
4. Design and development of reprogrammable FPGA.
5. Illustrate and develop HDL computational processes with improved design strategies.

TEXT BOOKS:

1. M.J.S Smith, “Application Specific integrated circuits”, Addition Wesley Longman Inc. 1st Edition 2010.
2. Kamran Eshraghian, Douglas A.pucknell and Sholeh Eshraghian, “Essentials of VLSI circuits and system”, Prentice Hall India, 2005, 1st Edition.

REFERENCES:

1. Donald G. Givone, “Digital principles and Design”, Tata McGraw Hill, 2002, 1st Edition.

2. Charles H. Roth Jr., “Fundamentals of Logic design”, Thomson Learning, 7th Edition 2013.
3. Nurmi, Jari (Ed.) “Processor Design System-On-Chip Computing for ASICs and FPGAs”, Springer, 2007, 1st Edition.
4. Joao Cardoso, Michael Hübner, "Reconfigurable Computing: From FPGAs to Hardware/Software Codesign" Springer, 2011, 1st Edition.
5. Pierre-Emmanuel Gaillardon, Reconfigurable Logic: Architecture, Tools, and Applications, 1st Edition, CRC Press, 2018.

WEB REFERENCES:

1. https://www.tutorialspoint.com/vlsi_design/vlsi_design_vhdl_introduction.htm#:~:text=VHDL%20stands%20for%20very%20high,DoD)%20under%20the%20VHSIC%20program.

ONLINE COURSES / RESOURCES:

1. https://archive.nptel.ac.in/courses/108/107/108107129/
2. http://gn.dronacharya.info/ECEDept/Downloads/QuestionPapers/7th_Sem/VLSIDESIGN/UNIT-1/Lecture-3.pdf
3. https://web.itu.edu.tr/~ateserd/vlsi2/2007/FPGAs&CPLD.pdf
4. https://kanchiuniv.ac.in/coursematerials/GSK_Notes_on_PLD_in_VLSI_design.pdf
5. https://www.xilinx.com/products/silicon-devices/resources/programming-an-fpga-anintroduction-to-how-it-works.html
6. https://www.allaboutcircuits.com/technical-articles/what-is-an-fpga-introduction-toprogrammable-logic-fpga-vs-microcontroller

21EE1005	ENERGY CONSERVATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings
- Utilise the available resources in optimal ways

UNIT - I INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT - II ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT - III THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and Encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT - IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems –Cooling Towers – D.G. sets.

UNIT - V ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept.

TOTAL = 45 PERIODS

OUTCOMES:

At the end of this course, the students will have the ability to:

1. Remember the knowledge for Basic combustion and furnace design and selection of thermal and mechanical energy equipment.
2. Study the Importance of Stoichiometry relations, Theoretical air required for complete combustion.
3. Skills on combustion thermodynamics and kinetics
4. Apply calculation and design tube still heaters.
5. Studied different heat treatment furnace.
6. Practical and theoretical knowledge burner design.

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com. a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. “Design and Management for Energy Conservation”, Pergamon Press, Oxford, 1981
3. Dryden. I.G.C., “The Efficient Use of Energy” Butterworths, London, 1982
4. Turner. W.C., “Energy Management Hand book”, Wiley, New York, 1982
5. Murphy. W.R. and G. Mc KAY, “Energy Management”, Butterworths, London 1987

21EE1002	HYBRID ENERGY TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide knowledge about different types of hybrid energy systems.
- To analyze the various electrical Generators used for the Wind Energy Conversion Systems
- To design the power converters used in SPV Systems.
- To analyze the various power converters used in hybrid energy systems and to understand the importance of standalone and grid-connected operation in Hybrid renewable energy systems.
- To design the power converters used in SPV Systems
- To analyze the performance of the various hybrid energy systems

UNIT - I INTRODUCTION TO HYBRID ENERGY SYSTEMS 9

Hybrid Energy Systems – Need for Hybrid Energy Systems – Solar-Wind-Fuel Cell-Diesel, Wind- Biomass-Diesel, Micro-Hydel-PV, Ocean and geyser energy - Classification of Hybrid Energy systems – Importance of Hybrid Energy systems – Advantages and Disadvantages - Environmental aspects of renewable energy - Impacts of renewable energy generation on the environment - Present Indian and international energy scenario of conventional and RE sources - Ocean energy, Hydel Energy – Wind Energy, Biomass energy, Hydrogen energy - Solar Photovoltaic (PV) and Fuel cells: Operating principles and characteristics.

UNIT - II ELECTRICAL MACHINES FOR WIND ENERGY CONVERSION SYSTEMS (WECS) 9

Review of reference theory fundamentals –Construction, Principle of operation and analysis: Squirrel Cage Induction Generator (SCIG), Doubly Fed Induction Generator (DFIG) - Permanent Magnet Synchronous Generator (PMSG).

UNIT - III POWER CONVERTERS AND ANALYSIS OF SOLAR PV SYSTEMS 9

Power Converters for SPV Systems - Line commutated converters (inversion-mode) - Boost and buck- boost converters- selection of inverter, battery sizing, array sizing - Analysis of SPV Systems – Block diagram of the solar PV systems - Types of Solar PV systems: Stand-alone PV systems.

UNIT - IV ANALYSIS OF POWER CONVERTERS FOR HYBRID ENERGY SYSTEMS 9

Introduction to Power Converters – Stand-alone Converters -AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters - Bi-Directional Converters - Grid-Interactive Inverters - Matrix converter – Merits and Limitations.

UNIT - V CASE STUDIES FOR HYBRID RENEWABLE ENERGY SYSTEMS 9

Hybrid Systems- Range and type of Hybrid systems – Performance Analysis – Cost Analysis – Case studies of Diesel-PV, Wind-PV-Fuel-cell, Micro-hydel-PV, Biomass-Diesel-Fuel-cell systems.

45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Analyze the impacts of hybrid energy technologies on the environment and demonstrate them to harness electrical power.
2. Select a suitable Electrical machine for Wind Energy Conversion Systems and simulate wind energy conversion system.
3. Design the power converters such as AC-DC, DC-DC, and AC-AC converters for SPV systems.
4. Analyze the power converters such as AC-DC, DC-DC, and AC-AC converters for Hybrid energy systems
5. Interpret the hybrid renewable energy system

TEXT BOOKS:

1. Bahman Zohuri, “Hybrid Energy Systems”, Springer, First Edition, 2018.
2. S.M. Muyeen, “Wind Energy Conversion Systems”, Springer First Edition, 2012
3. Md. Rabiul Islam, Md. Rakibuzzaman Shah, Mohd Hasan Ali, "Emerging Power Converters for Renewable Energy and Electric Vehicles", CRC Press, First Edison, 2021

REFERENCES:

1. Ernst Joshua, Wind Energy Technology, PHI, India, 2018, 3rd Edition.
2. S.N.Bhadra, D. Kastha, & S. Banerjee “Wind Electrical Systems”, Oxford University Press, 7th Impression, 2005
3. Rashid.M. H “Power electronics Hand book”, Academic press, 4th Edition, 2018.
4. Rai. G.D, “Non-conventional energy sources”, Khanna publishers, 6th Edition, 2017.
5. Gray, L. Johnson, “Wind energy system”, Prentice Hall of India, 2nd Edition, 2006.

WEB REFERENCES:

1. https://www.sciencedirect.com/topics/engineering/hybrid-energy-system
2. https://www.sciencedirect.com/topics/engineering/wind-energy-conversion-system

ONLINE COURSES / RESOURCES:

1. https://www.intechopen.com/chapters/64317

21CS1009	BUSINESS INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES: The student should be made to:

- Be exposed with the basic rudiments of business intelligence system.
- Understand the modeling aspects behind Business Intelligence.
- Understand of the business intelligence life cycle and the techniques used in it.
- Be exposed with different data analysis tools and techniques.
- Enabling factors in business intelligence projects

UNIT - I BUSINESS INTELLIGENCE 9

Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

UNIT - II KNOWLEDGE DELIVERY 9

e-business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT - III EFFICIENCY 9

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis.

UNIT - IV BUSINESS INTELLIGENCE APPLICATIONS 9

Marketing models – Logistic and Production models – Case studies.

UNIT - V FUTURE OF BUSINESS INTELLIGENCE 9

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Know the basics and fundamentals of business intelligence applications
2. Apply various modeling techniques.
3. Explain the data analysis and knowledge delivery stages.
4. Apply business intelligence methods to various situations.

5. Decide on appropriate technique by applying the tools in day-to-day situations

TEXT BOOKS:

1. Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, 9th Edition, Pearson 2013

REFERENCES:

1. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.
2. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager"s Guide”, Second Edition, 2012.
4. Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw- Hill, 2007.
5. Ralph Kimball, Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007

21GE1002	HUMAN RESOURCE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES: The student should be made :

- To provide knowledge about management issues related to staffing,
- To provide knowledge about management issues related to training
- To provide knowledge about management issues related to performance
- To provide knowledge about management issues related to compensation
- To provide knowledge about management issues related to human factors consideration and compliance with human resource requirements.

UNIT - I INTRODUCTION TO HUMAN RESOURCE MANAGEMENT 9

The importance of human resources – Objective of Human Resource Management - Human resource policies - Role of human resource manager

UNIT - II HUMAN RESOURCE PLANNING 9

Importance of Human Resource Planning – Internal and External sources of Human Resources - Recruitment - Selection – Socialization.

UNIT - III TRAINING AND EXECUTIVE DEVELOPMENT 9

Types of training and Executive development methods – purpose – benefits.

UNIT - IV EMPLOYEE COMPENSATION 9

Compensation plan – Reward – Motivation – Career Development - Mentor – Protege relationships

UNIT - V PERFORMANCE EVALUATION AND CONTROL 9

Performance evaluation – Feedback - The control process – Importance – Methods – grievances – Causes – Redressal methods.

Total:45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Students would have gained knowledge on the various aspects of HRM
2. Students will gain knowledge needed for success as a human resources professional.
3. Students will develop the skills needed for a successful HR manager.
4. Students would be prepared to implement the concepts learned in the workplace..
5. Students would be aware of the emerging concepts in the field of HRM

TEXT BOOKS:

1. Decenzo and Robbins, "Human Resource Management", 8th Edition, Wiley, 2007

2. John Bernardin. H., "Human Resource Management – An Experimental Approach", 5th Edition, Tata McGraw Hill, 2013, New Delhi.

REFERENCES:

1. Luis R, Gomez-Mejia, DavidB. Balkin and Robert L. Cardy, “Managing Human Resources", 7th Edition, PHI, 2012
2. Dessler, "Human Resource Management", Pearson Education Limited, 2007.

21ME1012	INDUSTRIAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various components and functions of production planning and control such as product planning, process planning, production scheduling.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).
- To make cost estimation for various products after process planning and product planning along with manufacturing time calculations

UNIT - I INTRODUCTION TO PRODUCTION AND OPERATIONS MANAGEMENT 9

Objectives and benefits of planning and control-Functions of production control-Types of production- job- batch and continuous-Product development and design-Marketing aspect -Functional aspects- Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration- Standardization, Simplification & specialization- Break even analysis-Economics of a new design.

UNIT - II PRODUCT PLANNING AND PROCESS PLANNING 9

Product planning-Extending the original product information-Value Analysis-Problems in lack of product planning-Process planning and routing-Prerequisite information needed for process planning- Steps in process planning-Quantity determination in batch production-Machine capacity, balancing- Analysis of process capabilities in a multi-product system.

UNIT - III PRODUCTION SCHEDULING 9

Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual Loading-Basic scheduling problems - Line of balance – Flow production scheduling- Batch production scheduling-Product sequencing – Production Control systems- Periodic batch control-Material requirement planning, KANBAN – Dispatching-Progress reporting and expediting. Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT - IV COST ESTIMATION 9

Importance of costing and estimation- Types of estimates – Estimating procedure-Methods of costing-elements of cost estimation, Estimation labor cost, material cost-allocation of overhead charges- Calculation of depreciation cost, Estimation of Different Types of Jobs - Estimation of Sheet metal Shop, Forging Shop, Welding Shop and Foundry Shop.

UNIT - V MACHINING TIME CALCULATION & RECENT TRENDS IN INDUSTRIAL ENGINEERING 9

Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations, Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding. Introduction to computer integrated production planning systems- elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

TOTAL= 45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Understand the basic concepts of production and operations management with cost considerations
2. Understand the concepts of value analysis, process capabilities, balancing for product and process planning
3. Understand fundamental concepts of scheduling theory by determining an optimal schedule for a flow shop and also to solve complex job shop problems, design and evaluate various feasible job shop schedules.
4. Enable both the costing and estimating procedures for all type of industry with overheads
5. Understand the importance of machining time along with recent trends like JIT, MRP - II and ERP.

TEXT BOOKS:

1. Martand T Telsang, “Industrial Engineering and Production Management”, Third Revised edition, S. Chand and Company, 2018.
2. Narang GBS and Kumar V, Production and Costing, Khanna Publishers, 2014

REFERENCES:

1. Panneerselvam. R, Production and operations Management, PHI, 3rd Edition, 2012
2. James. B. Dilworth,” Operations management – Design, Planning and Control for manufacturing and services” McGraw Hill International edition 1992..
3. William J Stevenson, Operations Management, McGraw Hill,13th Edition,2018.
4. Chary. S.N., “Production and Operations Management”, Tata McGraw Hill, 6th Edition, 2019.
5. Banga T R and Sharma S C, Estimating and Costing, Khanna Publishers, 2001.

WEB REFERENCES:

1. https://onlinelibrary.wiley.com/journal/19375956
2. https://www.managementstudyguide.com/production-and-operations-management.htm
3. https://www.slideshare.net/zimbar/product-and-process-planning

4. https://nulab.com/learn/project-management/production-scheduling-important/

5. https://www.smartsheet.com/ultimate-guide-project-cost-estimating

ONLINE COURSES / RESOURCES:

1. https://www.digimat.in/nptel/courses/video/110107141/L01.html

2. https://www.digimat.in/nptel/courses/video/110101132/L01.html

21CS1001	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm

UNIT - I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT - II VIRTUALIZATION 9

Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT - III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS –PaaS – SaaS – Architectural Design Challenges.

UNIT - IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security –Application Security – Virtual Machine Security.

UNIT - V CASE STUDIES 9

Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE-Open Stack .

TOTAL= 45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
2. Learn the key and enabling technologies that help in the development of cloud.
3. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
4. Explain the core issues of cloud computing such as resource management andsecurity.
5. Be able to install and use current cloud technologies.
6. Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud

TEXT BOOKS:

1. Buyya R., Broberg J., Goscinski A., Cloud Computing: Principles and Paradigm, FirstEdition, John Wiley and Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, Cloud Computing: Implementation, Management, And Security, CRC Press, 2017.

REFERENCES:

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), OReilly, 2009.

21CE1010	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT - I INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT - II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT - III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT - IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

UNIT - V INDOOR AIR QUALITY MANAGEMENT 9

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL= 45 PERIODS

OUTCOMES:

At the end of the course, students should be able to:

1. An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. Ability to identify, formulate and solve air and noise pollution problems
3. Ability to design stacks and particulate air pollution control devices to meet applicable standards.
4. Ability to select control equipments.
5. Ability to ensure quality, control and preventive measures.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, “Air Pollution Control Engineering”, Tokyo, springer science + science media LLC,2004.

2. Anjaneyulu. Y, “Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002
3. Noel de Nevers, “Air Pollution Control Engineering”, Waveland press,Inc 2017.

REFERENCES:

1. David H.F. Liu, Bela G. Liptak, “Air Pollution”, Lweis Publishers, 2000.
2. Arthur C. Stern, “Air Pollution (Vol.I – Vol.VIII)”, Academic Press, 2006.
3. Wayne T.Davis, “Air Pollution Engineering Manual”, John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, “Air Pollution”, Tata Mcgraw Hill Publishing Company limited, 2007.
5. C.S.Rao, “Environmental Pollution Control Engineering”, New Age International(P) Limited Publishers,2006